

# Development of a Simple, Easy, and Convenient Method for Cock Skeleton Preparation

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## Research Article

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## ABSTRACT

The primary goal of this study was to prepare the skeleton of cock using quick and convenient techniques for easy learning of avian anatomy. A total of five matured cocks were used to conduct the study. First of all, external observation of all body parts of the cock was done very carefully. After performing euthanasia, the birds were skinned and defleshed by using forceps and scalpels, and then boiled in a 4%-5% solution of soda water for 1 hour. After 90 minutes of cooling, all the bone samples were carefully cleaned up as far as possible, placed into a 10% bleaching water solution for 2 hours-3 hours, and then washed with clean water. Bone samples were left under strong sunlight for 5 hours-7 hours. Finally, the skeleton was prepared using good quality sticking materials and 20-gauge wire to arrange and articulate bony samples. Then it was fixed on a wooden stand. It takes about 15 hours-20 hours to complete the whole process. Finally, for demonstration purposes, the cock skeleton model was placed in a glass chamber.

## INTRODUCTION

Skeleton models are essential in anatomy classrooms and museums to increase anatomy comprehension, which is the most significant course in the preclinical stage <sup>[1]</sup>. A skeleton is the hard framework of an organism's body that supports, protects, and helps in locomotion. This hard structure protects the soft and delicate viscera of the body of

animals and birds [2]. Skeletons are regarded as mirrors of the body and realistic specimens that are superior to any sort of two-dimensional radiograph in terms of teaching and learning aids [3]. Knowledge about the skeletons of different domesticated animals and birds is considered essential for veterinary gross anatomy and also for the whole art of medicine. It is an excellent didactic material for any medical-related educational institution as well as in museums for exhibition purposes [4]. Basic knowledge of avian bones and skeletons is crucial for a superior understanding of avian anatomy. The correct anatomical setup of the skeleton model is significant for the institution, as well as veterinary practitioners, researchers, surgeons, and radiologists. The preparation of anatomically correct skeletons requires subjective knowledge of anatomy, which would be a challenging task for any non-teaching organization [5]. Osteology plays a pivotal role in the easy understanding of phylogenic development as well as the classification of avian species and also gives significant clues for the determination of actual relationships among taxa [6].

Skeletons (bones) are essential tools to perform research about phylogenic investigations into age and also for growth analyses of functional morphology [6-8]. For easy demonstration and to get ideas about different extinct wild animals, skeletons are kept in museums, institutions, and organizations. Universities and schools use skeletons for research and educational purposes. Besides these, collecting skeletons and bones of different avian species and mammals is very important for easy determination of body shape and size, and also for physiological or histological studies [9]. These are also crucial tools for forensic operations, such as identifying animals or birds that have been transported unlawfully [10]. The use of a large series of skeletons is highly convenient for identifying fossils, determining biodiversity within a species, and detecting food items taken by hunting animals or predatory birds [10]. As a result, the demand for animal and avian skeletons is growing at a rapid rate. Different anatomists use mostly traditional procedures for skeleton preparation. These procedures are time-consuming and take 45 days to 60 days to complete, depending on the size of the animals [9]. Outlines a conventional procedure that requires 1 months to 2 months of maceration and describes a simple method for preparing the skeletons of adult mice that takes only three (3) days [11,12]. Various veterinary anatomists have recently attempted to produce a concise, simple, and convenient procedure for obtaining a whole fresh skeleton in 3 days-15 days. Therefore, the current study was undertaken to develop a quick, cost-effective, and convenient method of preparing cock skeletons. This will aid in the proper teaching of veterinary anatomy in various universities and promote scientific knowledge.

## MATERIALS AND METHODS

In this experiment, five adult cocks were used. The cocks were more than 1.5 years old, and they were purchased from the local market in Sylhet Sadar. Following the concept of [5], hand gloves were used and extra caution was taken during the skeleton preparation to avoid stick injuries. Wire, varnish, a wooden platform with an iron rod, and high-quality adhesive have been used to assemble the skeleton.

### Preparation of the cock

All the cocks were kept fasted for overnight before being sacrificed with a sharp knife cut through the throat, severing the carotid artery and the trachea. Some were killed by cervical dislocation.

### Skinning, defleshing, and evisceration

Cocks were soaked in hot water to remove all the feathers from their bodies quickly and easily. Meat was removed to the maximum extent possible by using scissors, scalpel, forceps, and a knife. Evisceration of internal organs was

done properly. To prevent the loss of small bones, precautions were taken during the wrapping of different body segments with merkin clothes.

### **Carcass decomposition**

All the bony segments were boiled in a 3%-5% solution of soda water for 1 hour and kept in that solution for 90 minutes to decompose the muscles, tendons, and ligaments according to the concept [8,13] and used a soda water solution to facilitate the proper and complete digestion of muscles and other fleshy parts, which will make it much easier to remove muscles and related structures [9,14,15]. It is advisable to avoid excessive boiling.

### **Sequential arrangement of bones**

All of these body segments were taken out of the boiling pan very carefully. With a scalpel and a knife, the remaining flesh and tissue on the bones were scratched to a reasonable extent. Then the ribs were gently moved backward from the spine. On a sheet, the vertebrae and ribs were arranged in sequence. It was crucial to keep the bones in order and in the precise position where the ribs and vertebrae connected [9,14,15]. Following the concept of [4], all the bones were treated in a 30% hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) solution to improve their appearance. The bones were then washed and cleansed under running water.

### **Bleaching, drying and varnishing of bones**

The bones were then submerged in a 10% bleaching water solution for 2 hours-3 hours to prevent additional microbial destruction and left in strong sunlight for 5 hours-7 hours to completely dry. Lastly, varnishing was done to improve the aesthetics of the bones.

### **Assembling and articulation of bones into skeleton**

The bones were then articulated one by one and developed into skeletons. A 20-gauge wire was used to connect the ribs with the vertebral column by making a small hole with a drill machine. In the vertebral canals, a long (skull to coccygeal vertebral canal) strong wire was inserted to maintain the skeleton's weight. The tail and body wires were then connected, with enough wire projecting forward from the neck to allow the skull to be attached later by following the concept [9,14,15]. Each leg was built separately and attached in position with the help of wire and super glue. Ultimately, to finish the skeleton, the head was articulated with the vertebral column.

### **Positioning the skeleton**

The skeletons were placed on a base of wooden platforms of the required dimension according to the size of the cock. Finally, to prevent dust accumulation on the skeletons, they were placed in a glass chamber.

## **RESULTS AND DISCUSSION**

A skeleton is the structure that supports and protects the internal soft viscera of an animal body and birds [2]. Bones, cartilage, and ligaments help to form this hard framework that is responsible for maintaining the body's shape, flexibility, as well as locomotion of the body [16]. Actually, skeleton preparation is a technical issue, and there is less chance of offensive odor [5].

Since boiling softens and shrinks bones, mature cocks were employed to reduce the possibility of softening and shrinkage [13]. Fixation of carcass was not done because it extends the treatment duration but does not improve the skeleton preparation quality [17]. The goal of the study was to develop a quick method for skeleton preparation so that immediately after skinning, flesh was removed to its maximum extent. Depending on the size of the animals and birds, the carcass is typically placed in a pit for 1 months-2 months for decomposition purposes [11]. Usually, it

takes a lot of time, effort, and money to produce skeleton models by using conventional methods. It is possible to prepare skeleton models without full laboratory support by using proteolytic enzymes like neutrase and some other biological washing powders, soda water, or meat tenderizers [5]. However, other scientists cautioned against using biological washing powder because of its high corrosiveness, which might severely affect bone density. We applied sodium hydroxide for easy preparation of the cock skeleton, which is the most frequently used tool by animal disposal contractors [18]. The aim of this study was to develop a cost-effective method of skeleton preparation. That's why we avoided proteolytic enzymes like neutrase, which is expensive. All the bony segments were boiled in a 4%-5% solution of soda water for 60 minutes using a gas burner (Table 1). If a high-quality specimen is required, several researchers advise against using the boiling procedure. Bone mass and physical appearance can both be negatively impacted by boiling. According to the authors, the boiling procedure is rather simple and cost-effective, which supports the claims made by [13]. Cleaning and bleaching or degreasing were performed next. After carcass decomposition, samples were allowed to cool down for an hour. It took another 2 hours to 3 hours to separate the tenderized flesh from the muscle, which supports the methods followed [9,14,15]. Then all bony samples were placed in a 10% bleaching solution to prevent further biodegradation for 2 hours. Unpleasant odor may have established in bone samples as a result of microbial decomposition that agree the statement [5]. Following the bleaching process, all of the bones were washed in running tap water and completely dried in direct sunlight for 5 hours-7 hours (Table 1). The authors attempted to spend less time in the bleaching solution because it is corrosive to bone surface and density. Certain cavities may still contain some materials or have tenacious fragments of raw meat attached, which could raise concerns about the growth of pathogens. However, fully desiccated bones may cease microbial decomposition (<http://www.skullsite.co.uk/preparation.htm>). After varnishing, all the bones were then meticulously assembled and joined together using adhesive materials. To strengthen the joint, wire was inserted after drilling the bones (Figures 1). Each skeleton was placed in a display case on a wooden foundation and held up by a robust wire that was vertically positioned. Finally, for demonstrational purposes, the skeleton models were placed in a glass chamber. The entire process of creating a cocks' skeleton takes a day (16 hours–18 hours approximately).

**Table 1.** Steps for preparing Cock skeleton and time duration.

Steps	Tentative required time	Time schedule (Started from 5 am)
Defleshing and evisceration	2 hours	7:00 AM
Decomposing carcass	2-3 hours	10:00 AM
i) Boiling (Soda water)		
ii) Cooling	1 hour	11:00 AM
Bleaching	2 hours	1:00 PM
Cleaning	1 hour	2:00 PM
Sun dry	5 hours	7:00 PM
Assembling and positioning	4 hours	11:00 PM
Total=18 hours		

### CONCLUSION

Without heavily relying on laboratory resources, the authors developed a simple, rapid, and economical method for the development of cock skeleton model. The major advantages of this technique are less chance of losing small bones, further use of different internal organs, and a short time requirement. Finally, a magnificent and attractive cock skeleton is raised and maintained in the anatomy lab for display and scientific study purposes. This study might be helpful for easy learning of avian anatomy in veterinary medicine.

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### CONFLICT OF INTEREST

All the authors do not have any possible conflicts of interest.

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